What is claimed is:

1. A method for etching an anti-reflective coating (ARC) layer on a substrate in a plasma processing system comprising:

introducing a process gas comprising N_xO_y , wherein x and y are integers greater than or equal to unity;

forming a plasma from said process gas in said plasma processing system; and

exposing said ARC layer on said substrate to said plasma.

- 2. The method as recited in claim 1, wherein said introducing of said process gas comprises introducing at least one of NO, NO₂, and N₂O.
- 3. The method as recited in claim 1, wherein said introducing of said process gas further comprises introducing an inert gas.
- 4. The method as recited in claim 3, wherein said introducing of said inert gas comprises introducing a Noble gas.
- 5. The method as recited in claim 1, wherein said exposing comprises exposing said ARC layer for a first period of time.
- 6. The method as recited in claim 5, wherein said exposing for said first period of time comprises determining said first period of time by endpoint detection.
- 7. The method as recited in claim 6, wherein said determining of said first period of time by endpoint detection comprises utilizing optical emission spectroscopy.
- 8. The method as recited in claim 5, wherein said exposing for said first period of time is followed by exposing said substrate or said ARC layer to said plasma for a second period of time.

- 9. The method as recited in claim 8, wherein said exposing for said second period of time comprises exposing said substrate to said plasma for a fraction of said first period of time.
- 10. A method of forming a bilayer mask for etching a thin film on a substrate comprising:

forming said thin film on said substrate;

forming an anti-reflective coating (ARC) layer on said thin film;

forming a photoresist pattern on said ARC layer; and

transferring said photoresist pattern to said ARC layer by plasma etching said ARC layer using a process gas comprising N_xO_y , wherein x and y are integers greater than or equal to unity.

- 11. The method as recited in claim 10, wherein said using of said process gas comprises using at least one of NO, NO₂, and N₂O.
- 12. The method as recited in claim 10, wherein said using of said process gas further comprises using an inert gas.
- 13. The method as recited in claim 12, wherein said using of said inert gas comprises using a Noble gas.
- 14. The method as recited in claim 10, wherein said transferring is performed for a first period of time.
- 15. The method as recited in claim 14, wherein said transferring for said first period of time is determined by endpoint detection.
- 16. The method as recited in claim 15, wherein said determining of said first period of time by endpoint detection comprises utilizing optical emission spectroscopy.

- 17. The method as recited in claim 14, wherein said transferring for said first period of time is followed by plasma etching said substrate or said ARC layer for a second period of time.
- 18. The method as recited in claim 17, wherein said plasma etching for said second period of time comprises exposing said substrate to said plasma for a fraction of said first period of time.
- 19. A plasma processing system for etching an anti-reflective coating (ARC) layer on a substrate comprising:
- a plasma processing chamber for facilitating the formation of a plasma from a process gas; and
- a controller coupled to said plasma processing chamber and configured to execute a process recipe utilizing said process gas to etch said ARC layer, wherein said process gas comprises N_xO_y , and x and y are integers greater than or equal to unity.
- 20. The system as recited in claim 19, further comprising a diagnostic system coupled to said plasma processing chamber, and coupled to said controller.
- 21. The system as recited in claim 20, wherein said diagnostic system is configured to receive a signal that is related to light emitted from said plasma.
- 22. The system as recited in claim 19, wherein said process gas comprises at least one of NO, NO_2 , and N_2O .
- 23. The system as recited in claim 19, wherein said process gas further comprises an inert gas.
- 24. The system as recited in claim 23, wherein said inert gas comprises a Noble gas.

- 25. The system as recited in claim 20, wherein said controller causes said ARC layer to be exposed to said plasma for a first period of time.
- 26. The system as recited in claim 25, wherein said first period of time is determined by endpoint detection determined by said diagnostic system.
- 27. The system as recited in claim 26, wherein said diagnostic system comprises an optical emission spectroscopy device.
- 28. The system as recited in claim 25, wherein said first period of time corresponds to the time to etch said ARC layer and is extended by a second period of time.
- 29. The system as recited in claim 28, wherein said second period of time is a fraction of said first period of time.